REMARKS/ARGUMENTS

The Examiner allowed claims 2-5, 7-14, 17-20, 22-29, 32-35, 37-41, 44, and 45.

The Examiner found that claims 6, 21, 36, 46, and 48 would be allowed if rewritten in independent form. Applicants amended claims 6, 21, and 36 to include the requirements of the base claims to place in condition for allowance. Applicants submit that claims 46 and 48 are patentable over the cited art in their current form because they depend from claim 43, which is patentable over the cited art for the reasons discussed herein.

Applicant amended claim 19 to correct a punctuation error.

1. Claims 1, 16, 31, and 43 are Patentable Over the Cited Art

The Examiner rejected claims 1, 16, 31, and 43 as anticipated (35 U.S.C. §102) by Brant (U.S. Patent No. 5,548,711). Applicants traverse.

Independent claims 1, 16, and 31 concern updating data in a storage device, and require: receiving an update to one or more blocks of customer data at addresses in the storage device; for each block of data to update, generating metadata indicating the address of the block in the storage device and an error checking code, wherein the error checking code is generated from the customer data and compared with the customer data to determine whether the customer data in the block has changed; for each block of data to update, writing the block of data to update and the metadata for the block to cache; and for each block of data to update, transferring the block of data and the metadata for the block from the cache to the storage device.

In the Final Office Action, the Examiner cited col. 21, lines 37-40 of Brant as disclosing the claim requirement of that for each block of data to update, generating metadata indicating the address of the block in the storage device. (Final Office Action, pg. 2). Applicants traverse.

The cited col. 21 mentions that each array controller must be able to address each data storage unit in the array and since each storage unit has one input port, each array controller is coupled to each data storage unit at a common point. Nowhere does the cited col. 21 anywhere disclose or mention the claim requirement of generating metadata that for each block of data to update indicating the address of the block in the storage device. Nowhere is there any mention of generating metadata indicating the address of the block in the storage device. Instead, the cited col. 21 discusses how a storage unit is addressed and nowhere discloses the claim requirement of

including in metadata the address of the block in the storage device that is written with the block of data to update.

The Examiner further cited col. 5, lines 1-10 of Brant. (Final Office Action, pg. 2) The cited col. 5 mentions that an error correction block is computed for each pending data block in the cache, and that the data block and error correction block are copied to the RAID system. Col. 5 further mentions that if a number of data blocks are to be written to the same stripe, an ECC block can te calculated from all blocks in the stripe at one time. Nowhere does this cited col. 5 anywhere disclose the claim requirement of generating metadata indicating the address of the block in the storage device. Instead, the cited error checking is based on the data block. The process of providing an error correction code for data does not disclose the claim requirement of generating metadata indicating the address of the block in the storage device in addition to the error code.

Following the telephone interview, the Examiner suggested consideration of col. 23, line 14 and col. 5, line 60 of Brant. Applicants reviewed both these sections and for the following reasons submit that they do not disclose the claim requirements of generating metadata indicating the address of the block of data in the storage device, where the metadata and the block are both written to the cache and then transferred from the cache to the storage device.

The cited col. 23 mentions that write data is written to a shadow RAM or data RAM. Once the data is stored in the data or shadow RAM, the controller updates a pending writes table within the RAMs to reflect the fact that write data has been received and is pending. The pending writes table indicates the starting address within the RAMs at which the write data is stored in the RAM. Once the data is written to the array, the writes table is updated to indicate that the write data is no longer pending.

The Examiner likens the write table address information of data to write to the claimed metadata. Applicants traverse. The claims require that the block of data and metadata for the block, which indicates the address of the block in the storage device, are both written to cache and then both transferred to the storage device. The cited col. 23 only mentions that the address of the data in the RAM is stored in the write table. Nowhere does the cited col. 23 disclose that the address information in the pending write table is transferred from the RAM to the array, i.e., storage device, with the data. Although the cited col. 23 discusses how the address of the data in

the RAM is maintained while the data is buffered in the RAM, nowhere does the cited col. 23 anywhere disclose that metadata including the address of where the block will be written in the storage device, i.e., the array in Brant, is written to cache and then transferred from the cache to the storage device. Nowhere, does the cited Brant disclose that any address information maintained in the pending write table is also transferred with the data to the storage device. Instead, the cited Brant only discusses maintaining an address of the data in the RAM, which corresponds to the claimed cache, not the storage device as claimed.

In other words, in Brant, the pending writes table indicates the address of the block of data in the RAM, not the storage device, which in Brant is the array, where the data will eventually be transferred. The claims require that the metadata in the cache indicate the address of the data in the storage device, not the address in the cache, i.e., RAM, such as the case with the pending writes table of Brant.

The Examiner has not cited any part of col. 23 or Brant that discloses that the metadata includes the address of the block in the storage device where the data will be stored, and that the data and such metadata are written to cache and then transferred to the storage device.

The newly cited col. 5, line 60 mentions a copyback cache storage that is non-volatile. Further, the copyback cache storage, which can be a disk drive, may be paired with a mirror storage unit. Notwithstanding the mention of a copyback cache storage device, nowhere does the cited col. 5 anywhere disclose that metadata, including the address of where the block is written in the storage device, is written to the cache with the data and then transferred with the data to the storage device as claimed.

Thus, Applicants submit that nowhere do all the above cited sections of Brant disclose that metadata for a data block indicate the address of the block in the storage device and an error checking code generated from the customer data, and that the data and block are written to cache and then both transferred from the cache to the storage device. This combination of operations are not disclosed in the cited Brant.

The Examiner cited col. 4, lines 60–65 of Brant as disclosing the claim requirements that for each block of data to update, the block of data to update and the metadata are written to cache and from the cache to the storage device. (Final Office Action, pg. 3). Applicants traverse.

The cited col. 4 mentions that when a write occurs in the RAID system, the data is written to a location in the cache storage unit and success is returned to the host. Nowhere does the cited col. 4 anywhere disclose that metadata, indicating the address of where the data is written in the storage device and the update for each block, are written to cache and then from the cache to the storage device. Instead, the cited col. 4 mentions that the data is written to the copyback cache. Further, the cited col. 5 discusses how an error correction block is computed and written with the data to the RAID system. Nowhere does the cited col. 4 disclose that both the metadata and the update for a block are written to the cache and then from the cache to the storage device. Instead, the cited col. 5 discusses how the error correction code is computed and written to the RAID, not written also to the cache and then from the cache to storage device as claimed.

Accordingly, claims 1, 16, and 31 are patentable over the cited art because the cited Brant does not disclose all the claim requirements.

Amended claim 43 includes many of the requirements of amended claims 1, 16, and 31 in computer readable form, by claiming at least one data structure having: blocks of customer data; and a block of metadata for each block of customer data, wherein the metadata includes the address of the block in the storage device and an error checking code, wherein the error checking code is generated from the customer data and is used to determine whether the customer data in the block has changed, wherein block of data to update and the metadata for the block are written to cache.

Applicants submit that claim 43 is patentable over the cited Brant because, for the reasons discussed above, Brant does not disclose the claim requirements of a block of metadata for each block of customer data, wherein the metadata includes the address of the block in the storage device and an error checking code generated from customer data that is used to determine whether the customer data in the block has changed, wherein both the block of data to update and the metadata for the block are written to cache.

Accordingly, claims 1, 16, 31, and 43 are patentable over the cited art because the cited Brant does not disclose all the claim limitations.

1. Claims 15, 30, and 42 Are Patentable Over the Cited Art

The Examiner rejected claims 15, 30, and 42 as obvious (35 U.S.C. §103) over Brant in view of Cheong (U.S. Patent No. 5,533,189). Applicants traverse.

Claims 15, 30, and 42 depend from claims 1, 16, and 31 and require that the error checking code is further capable of being used to determine whether the metadata in the block has changed. The Examiner cited col. 1, line 60 to col. 2, line 5 of Cheong as disclosing the additional requirements of these claims. (Final Office Action, pgs. 3-4) Applicants traverse for the following reasons.

The cited cols. 1 and 2 of Cheong discuss that ECC is used to detect errors during transmission of data. The cited Cheong mentions that for memory addresses, the address for finding the entries and the stats information must be maintained so there is no loss of data in the memory address, because the loss of one bit within an address may result in a loss of the associated data. The ECC is used to detect errors in the memory address.

Nowhere does the cited cols. 1 and 2 anywhere disclose that the checking of the code is capable of determining whether the metadata in the block in the storage device has changed, where the metadata indicates the address of the block of data in the storage device and an error checking code generated from the customer data. Instead, the cited ECC of Cheong concerns detecting whether there is an error in the memory address, not the metadata in the block in the storage device. Moreover, the ECC of Cheong concerns detecting errors in a memory address maintained in memory, not metadata in a block in a storage device as claimed.

Accordingly, claims 15, 30, and 42 are patentable over the cited art because they depend from claims 1, 16, and 31, which are patentable over the cited art for the reasons discussed above and because the limitations of claims 15, 30, and 42 provide additional grounds of patentability over the cited art.

2. Claim 47 Are Patentable Over the Cited Art

The Examiner rejected claims 47 as obvious (35 U.S.C. §103) over Brant in view of DeKoning (U.S Patent No. 5,761,705) Applicants traverse.

Claim 47 is patentable over the cited art because it depends from claim 43, which is patentable over the cited art for the reasons discussed above.

Conclusion

For all the above reasons, Applicant submits that the pending claims 1-48 are patentable over the art of record. Applicants submit herewith the fee for the claim amendments. Nonetheless, should any additional fees be required, please charge Deposit Account No. 09-0449.

The attorney of record invites the Examiner to contact him at (310) 553-7977 if the Examiner believes such contact would advance the prosecution of the case.

Dated: February 8, 2005

By: _____
David W. Victor
Registration No. 39,867

Please direct all correspondences to:

David Victor
Konrad, Raynes & Victor, LLP
315 South Beverly Drive, Ste. 210
Beverly Hills, CA 90212
Tel: 310-553-7977
Fax: 310-556-7984